Armed Forces College of Medicine

AFCM

T cell development

Dr.Alaa Ahmed Aly

Professor of Microbiology & Immunology

ILOs of Immunogens,Antigens & Self molecule

By the end of this lecture the student will be able to:

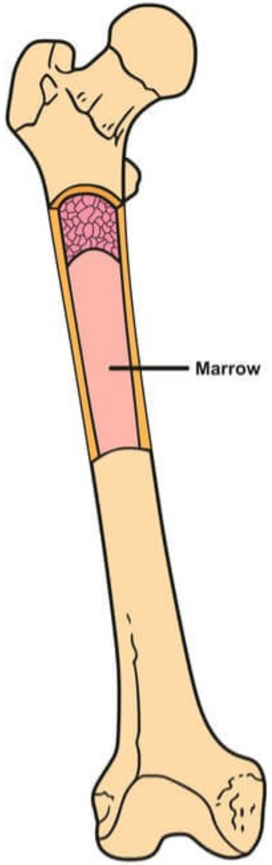
1. Outline series of reactions and functions of cell mediated immunity
2. Compare between MHC class I and II regarding structure , function and importance in health
3. Discuss steps of development of T lymphocytes in thymus.

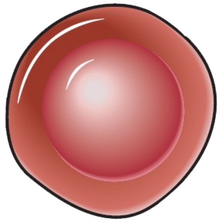
Organs of the immune system

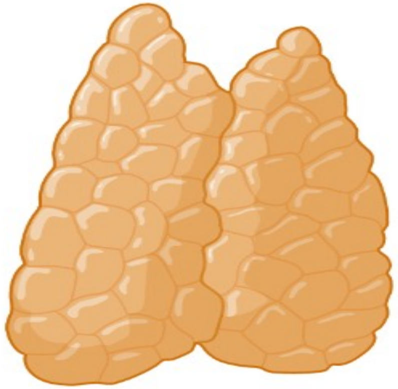
I) 1ry (Central) Lymphoid Organs

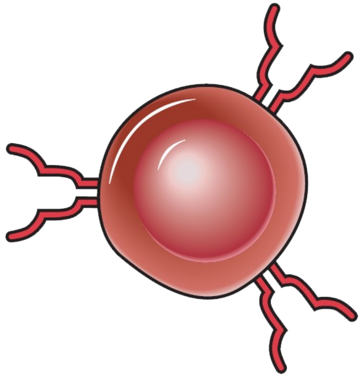
B) Thymus

Maturation of T lymphocytes (expression of Ag receptor)





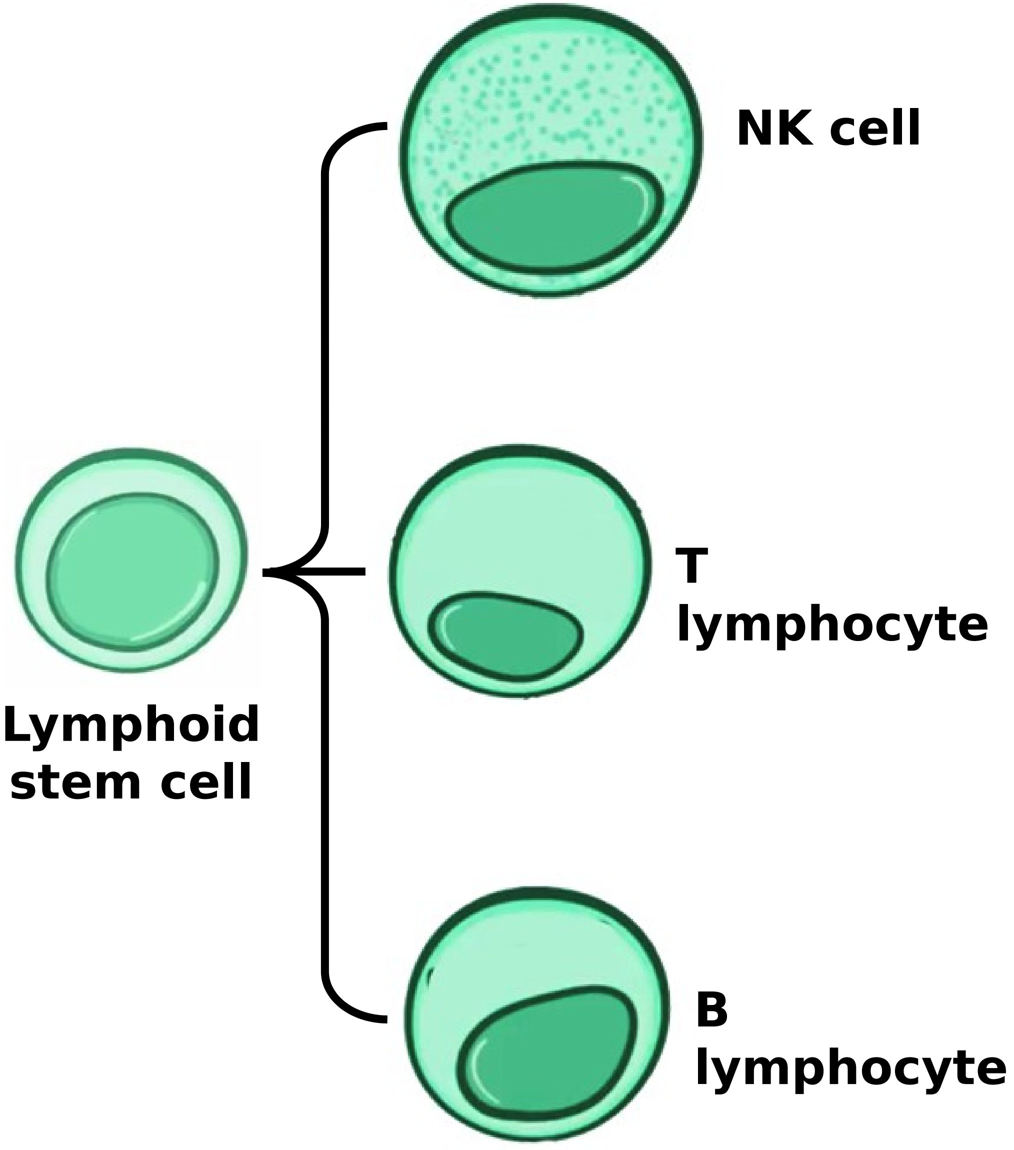




1 T cell clone

نسيلة

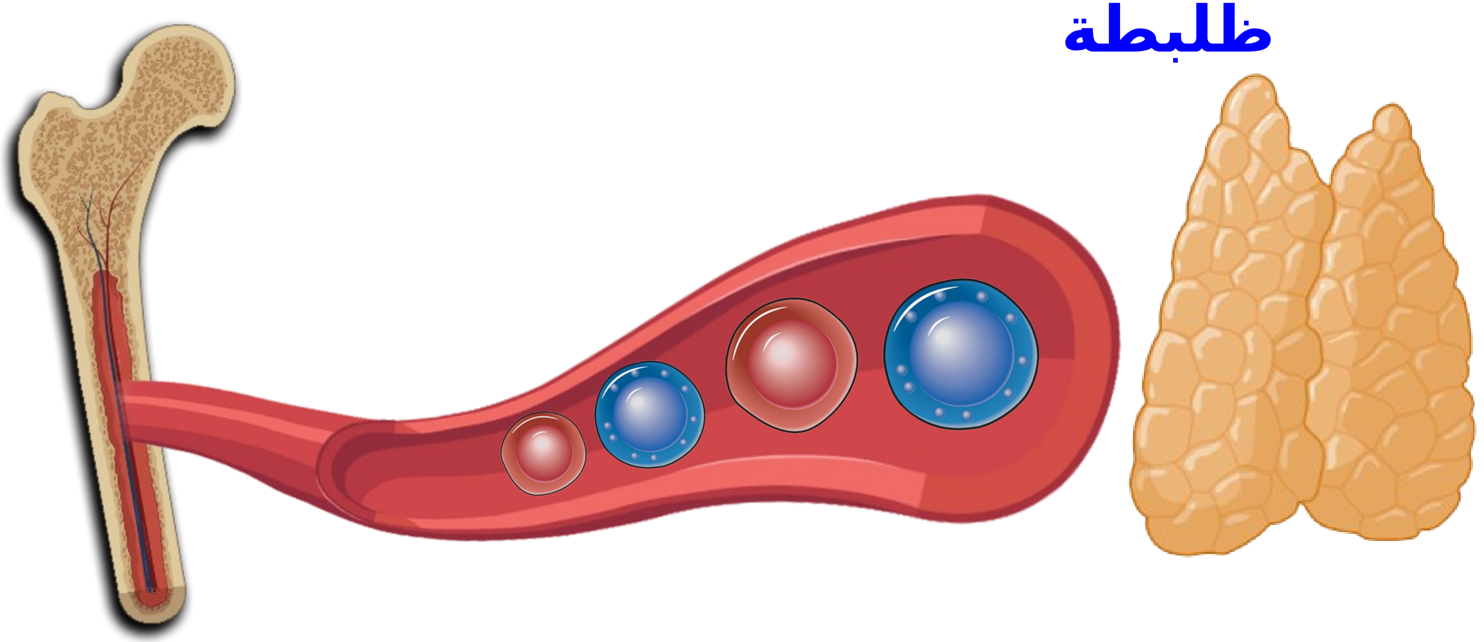
I Origin of T phocytes



لاعلامات سطحية

No surface markers

ظلبطة



From **lymphoid stem cells** in bone marrow

⬇

Immature thymocytes

⬇

Circulate in blood with **no surface markers**

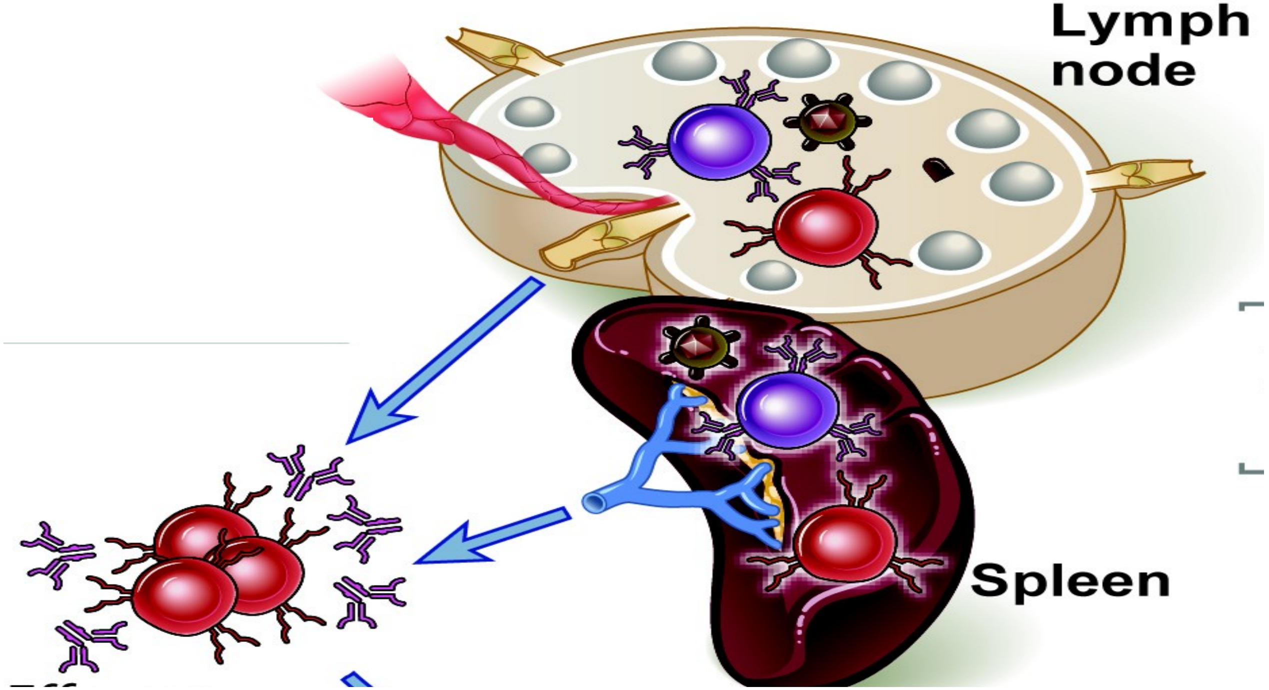
II) 2ry (peripheral) lymphoid organs

Lymph node

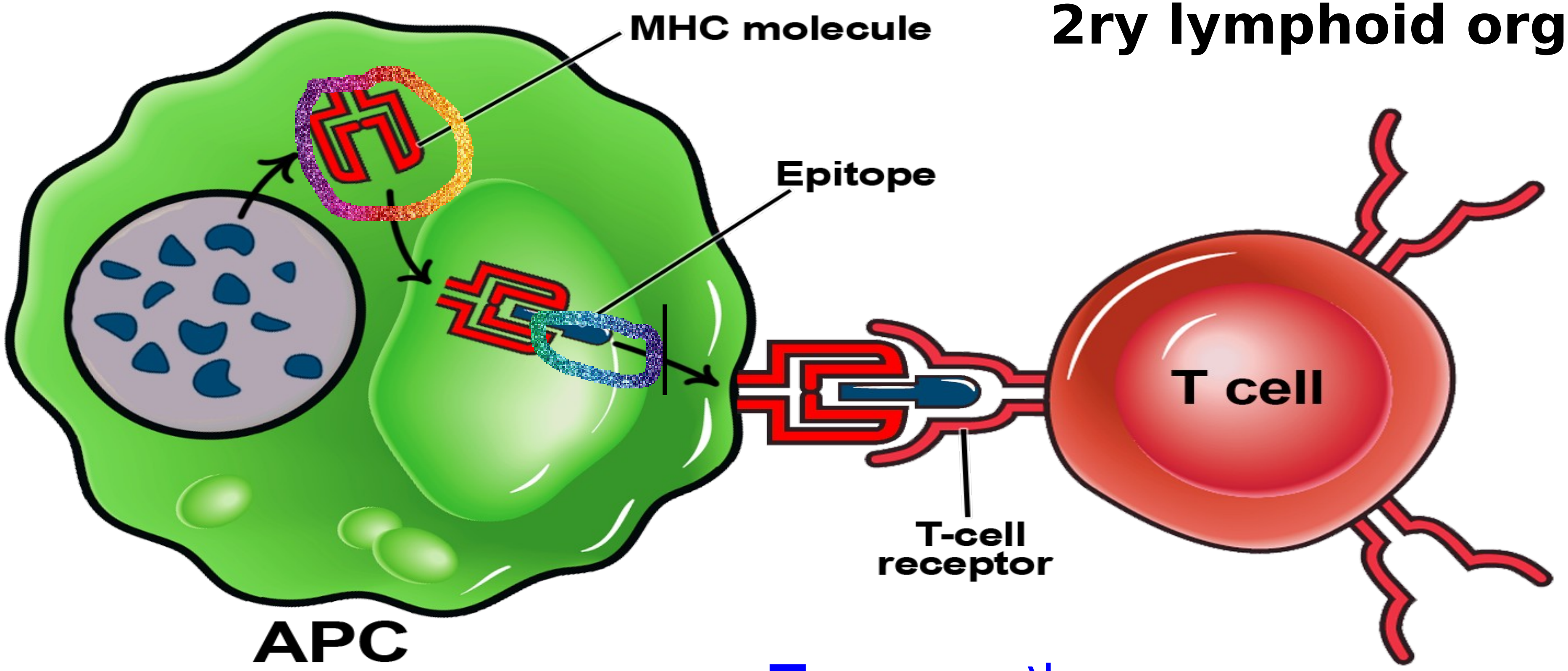
Spleen

2) Initiation of adaptive immune response

Site of⊕ of mature B & T lymphocytes



2ry lymphoid organs



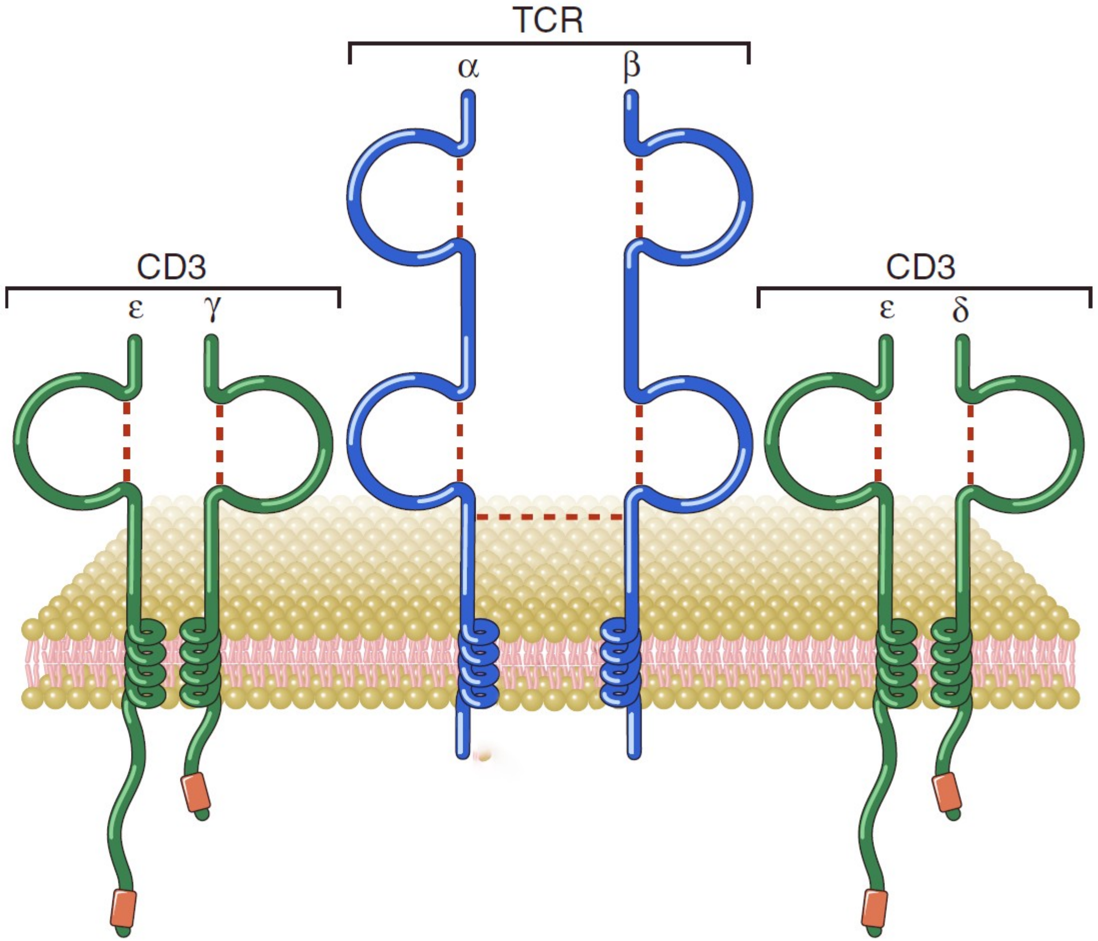
لازم نحضر T cell للتعرف على epitope + MHC

T cells : CD3
- Th : CD4
- Tc : CD8

II Stages of turation

A Expression of T cell receptor (TCR) complex

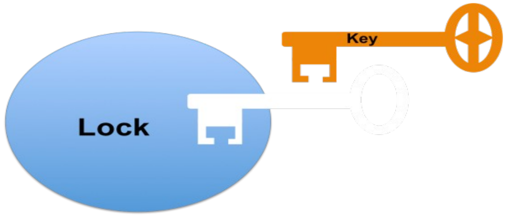
α & β polypeptide chains



II Stages of turation

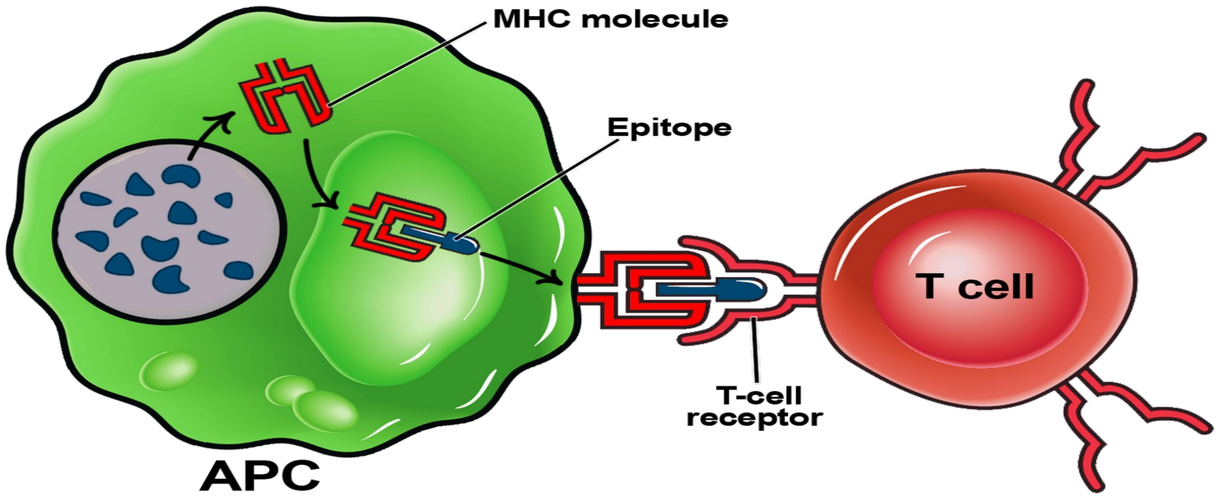
A Expression of T cell receptor (TCR) complex

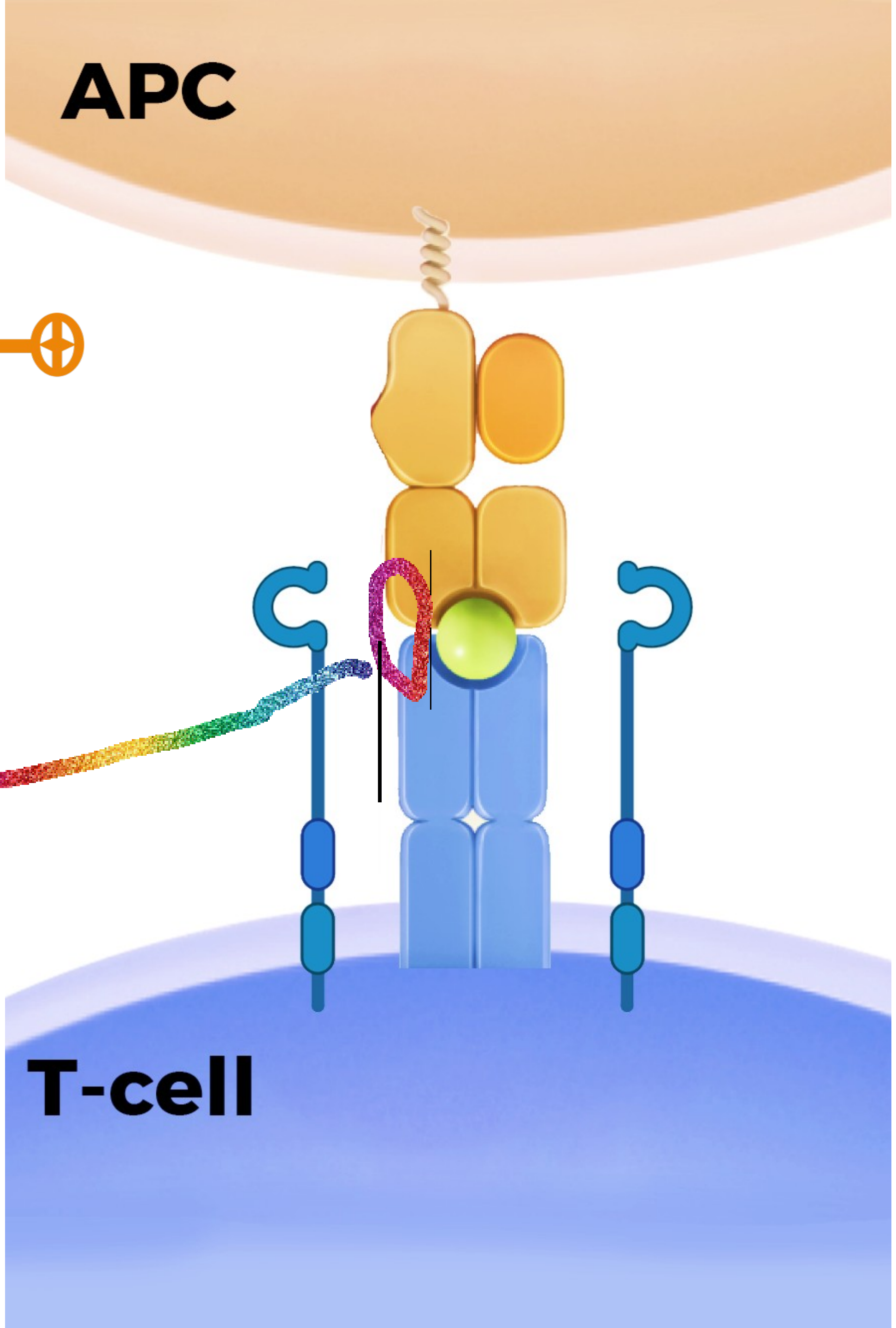
V (variable) region recognizes :



Specific peptide Ag (epitope): (Complementary to it)

Part of MHC mol





II Stages of turation

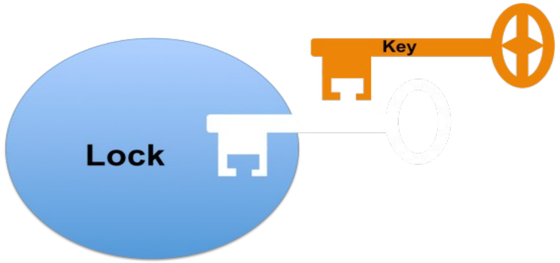
A Expression of T cell receptor (TCR) complex

TCR Formed of **α** & **β** polypeptide chains having:

1) C (constant) region

2) V (variable) region

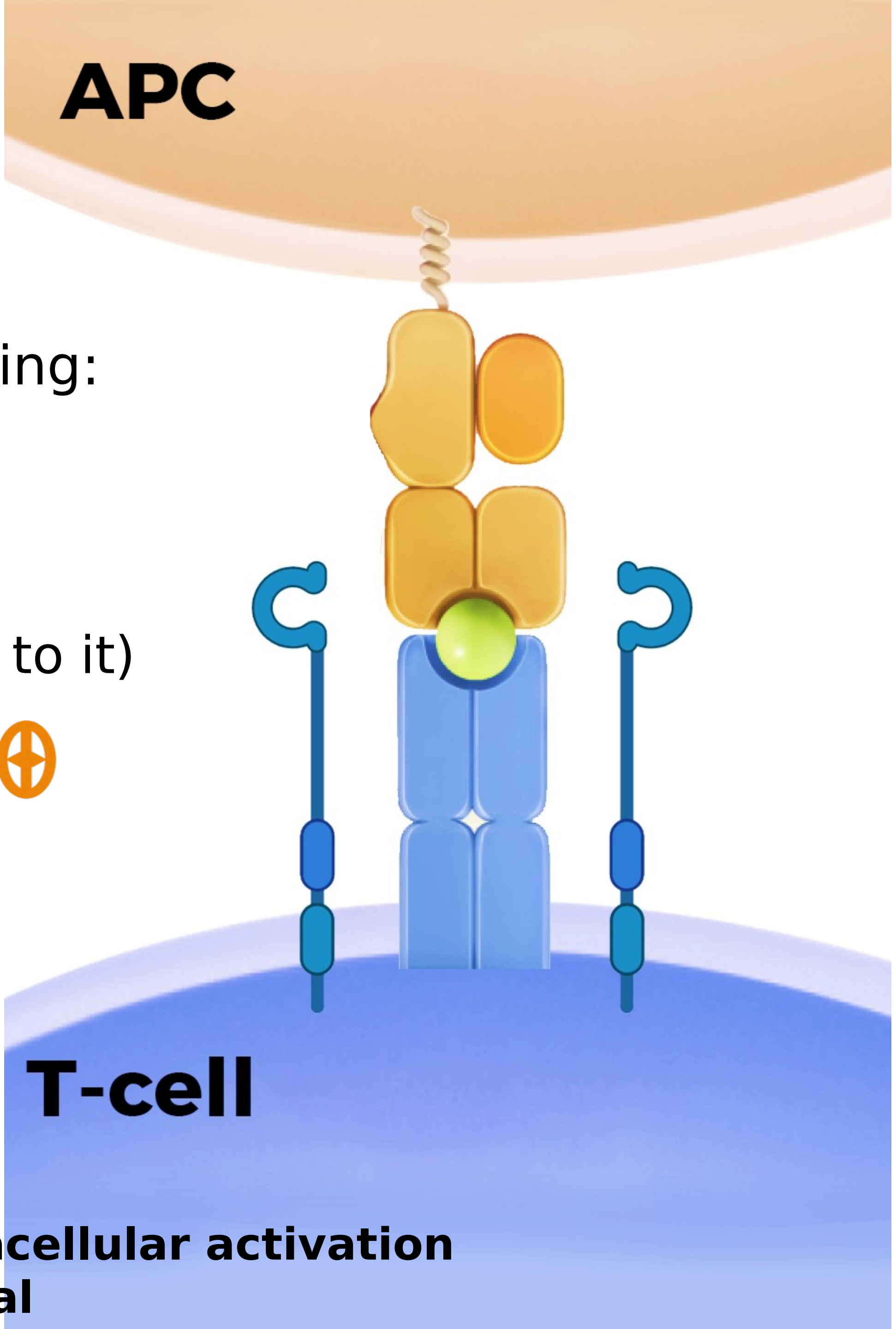
recognizes:
- Specific peptide Ag (epitope): (Complementary to it)
- Part of MHC mol



CD3

Associated with TCR →

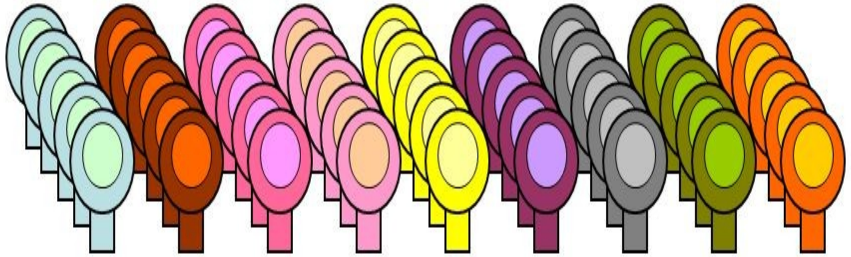
Transmits intracellular activation signal



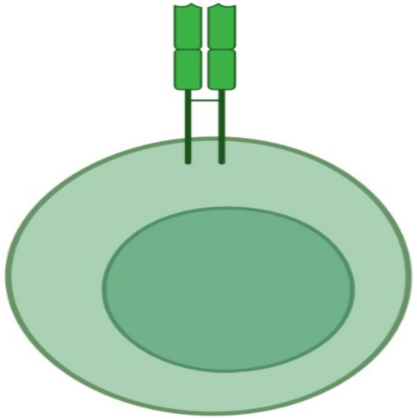
Intracellular activation signal

Comparison between innate & adaptive immunity

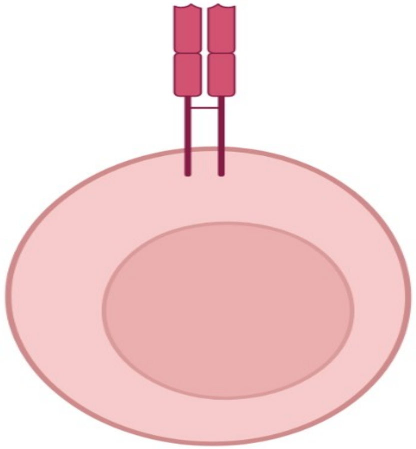
	Adaptive (Acquired) immunity
خصوصية Specificity	Each B & T cell clone has a **unique receptor** reacting only with **its specific Ag(epitope)**



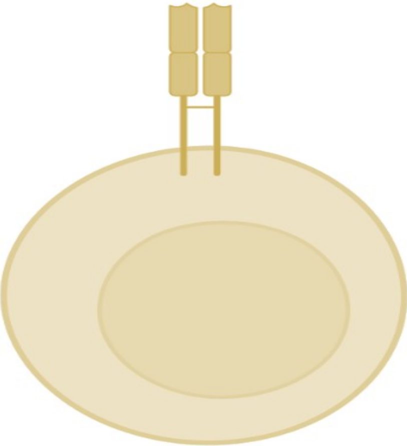
Millions of different specific T clones



Clone 1

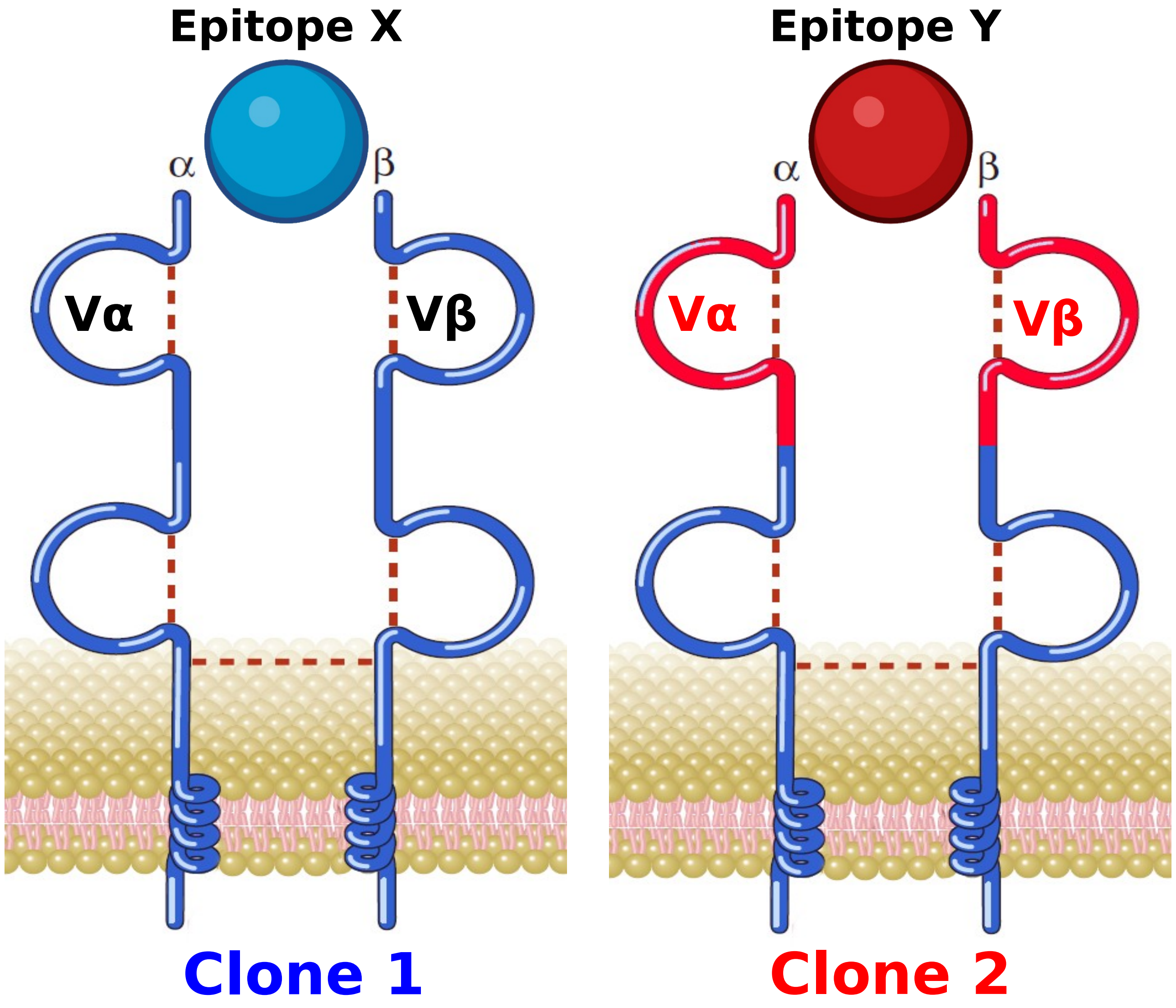


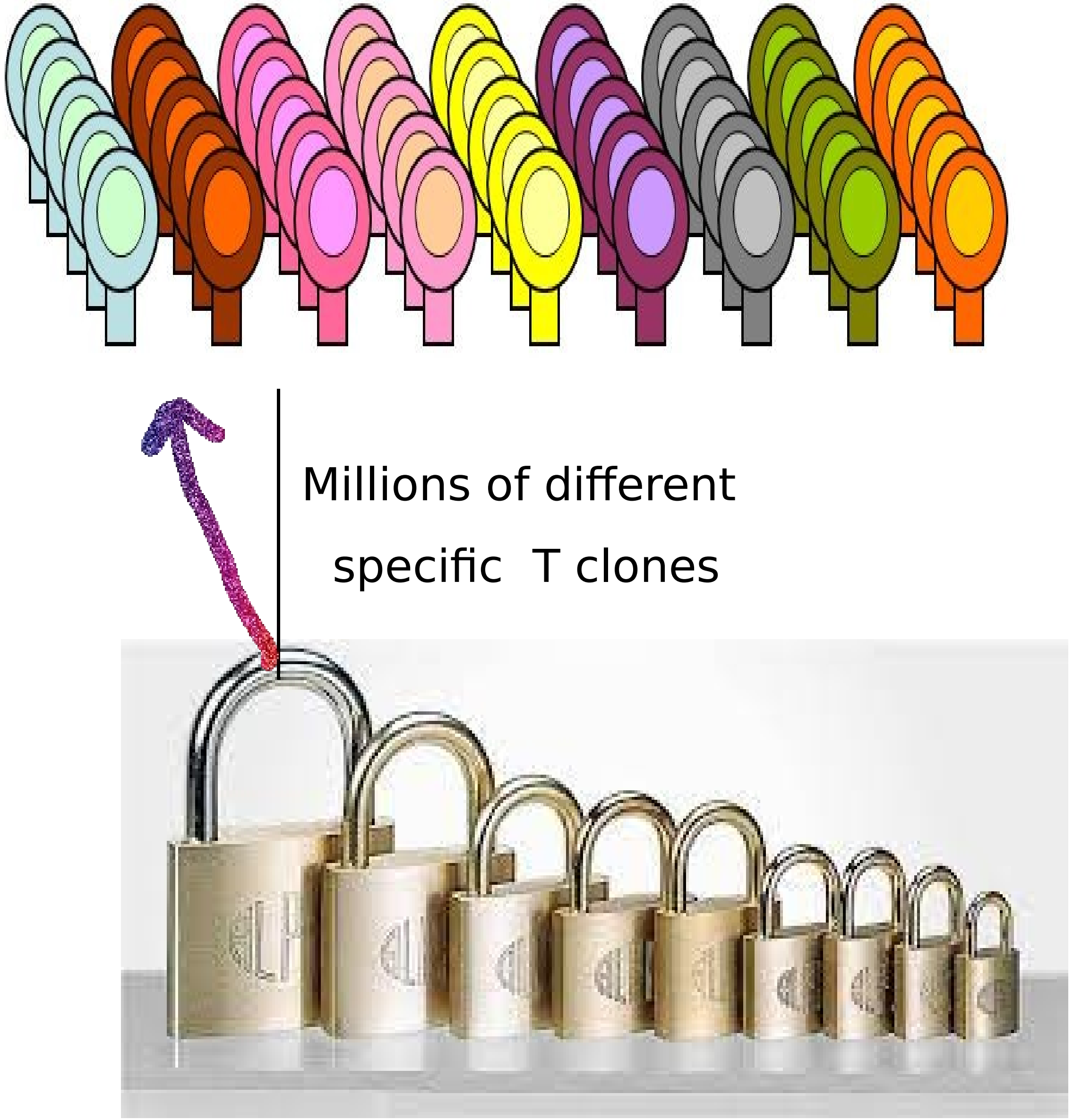
Clone 2



Clone 3

Diversity of TCR





Millions of different

specific T clones

Diversity & Specificity of TCR

Each T cell clone expresses TCR specific for 1 epitope

كل نسيلة عليها مستقبل محصوص
لايبيتوب واحد

↓

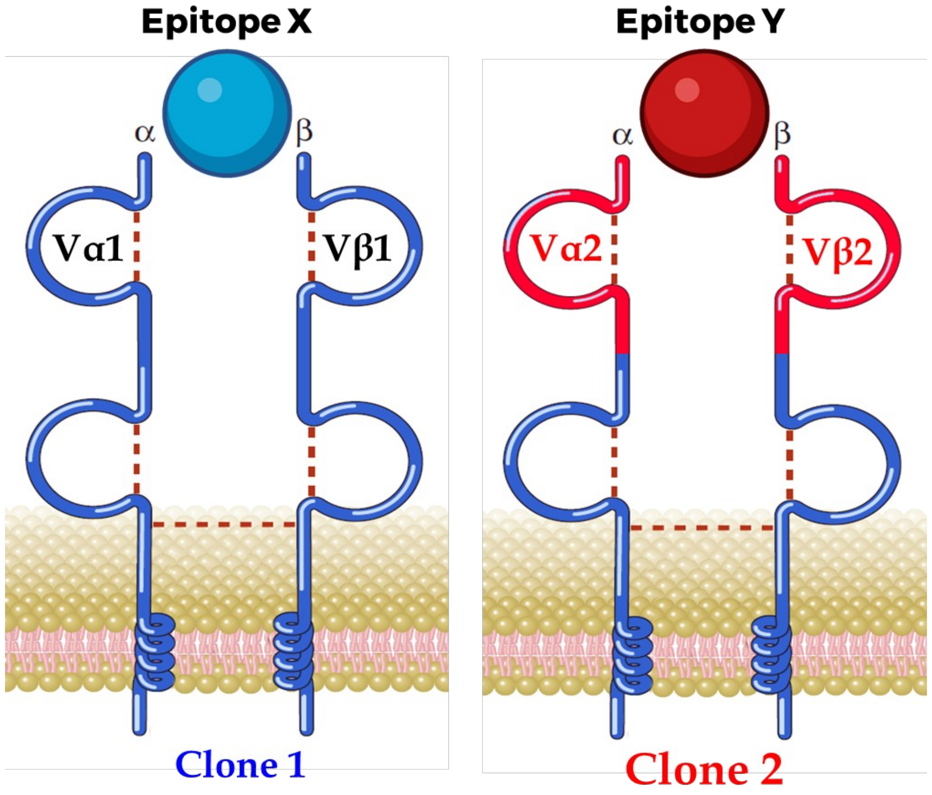
Millions of T cells clones with different TCR

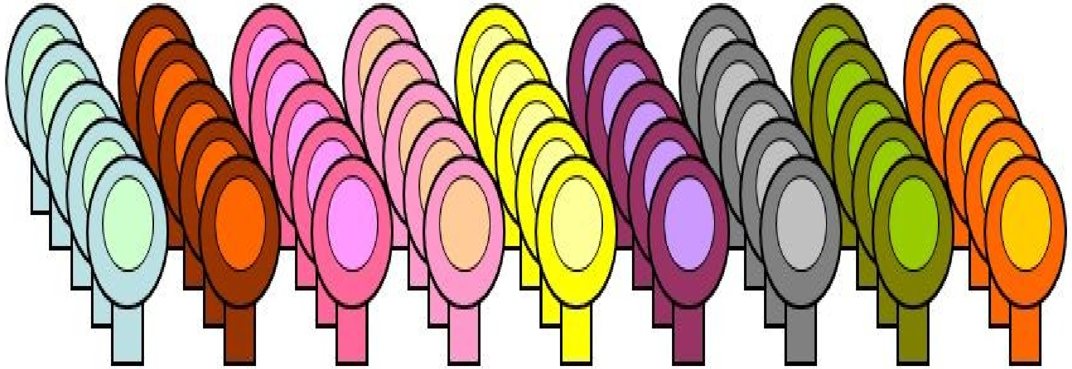
ملايين النسائل عليها
مستقبلات مختلفة

↓

Can react with millions of different epitopes

تتفاعل مع ملايين
الايبيتوبس





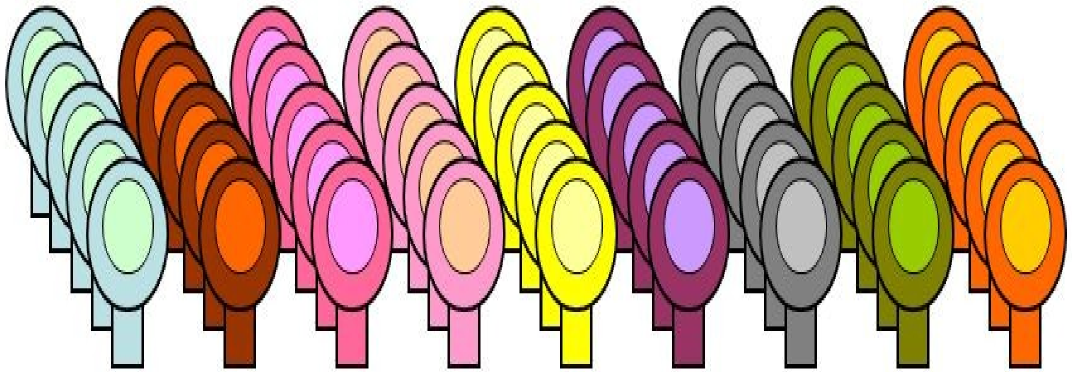
Millions of different specific T clones

Thymus حتعمل اختبارين على كل كلون

B Positive selection

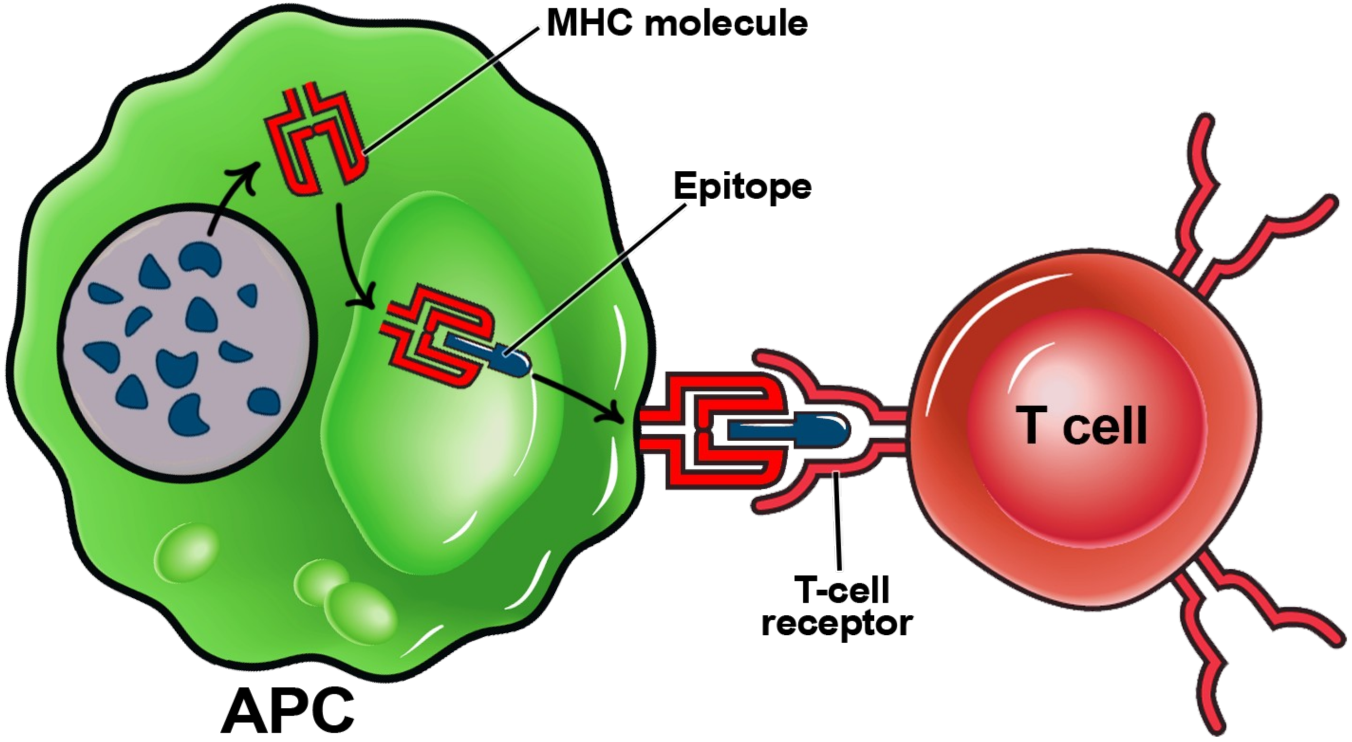
C Negative selection

كيف نتاكد من ان TCR سيتفاعل مع ? MHC

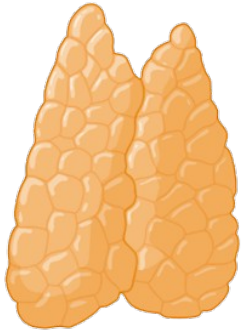


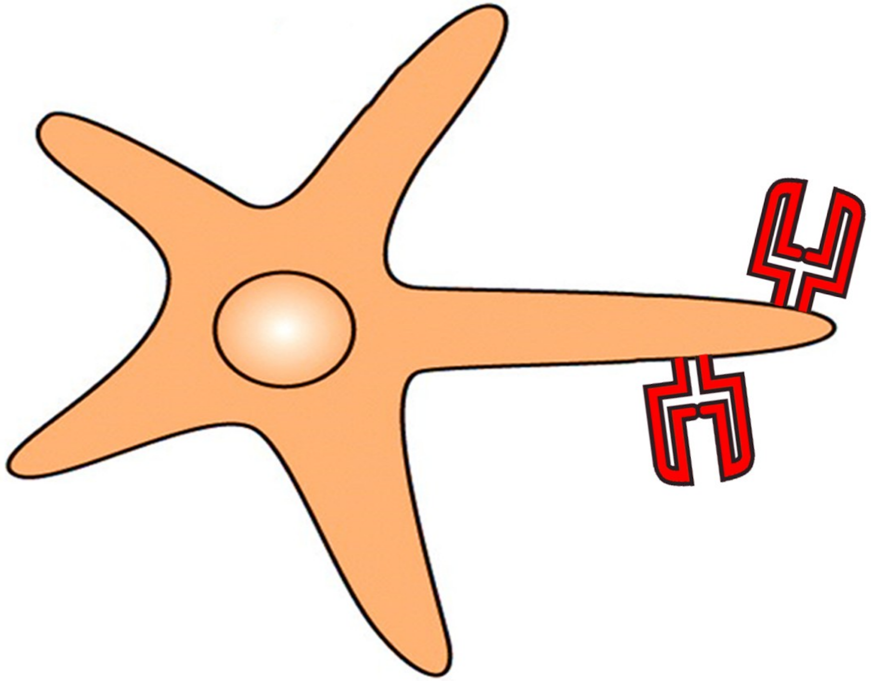
Millions of different

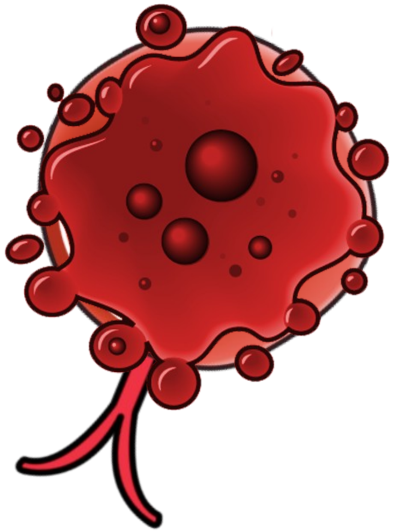
specific T clones

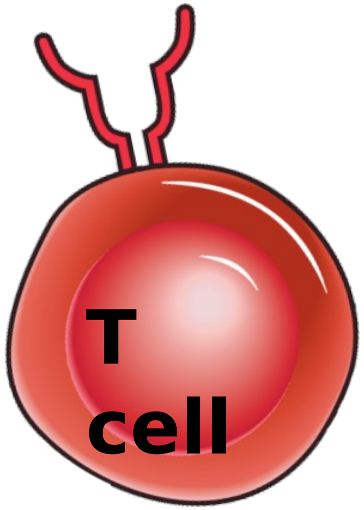


B Positive selection : اختيار ايجابي :تختار كلون لتحفزها







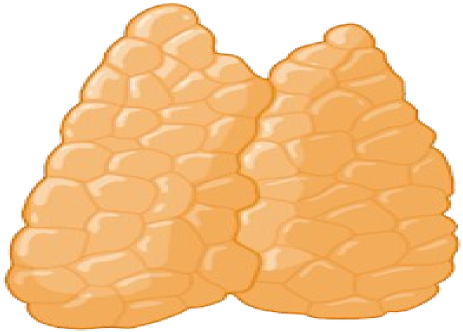


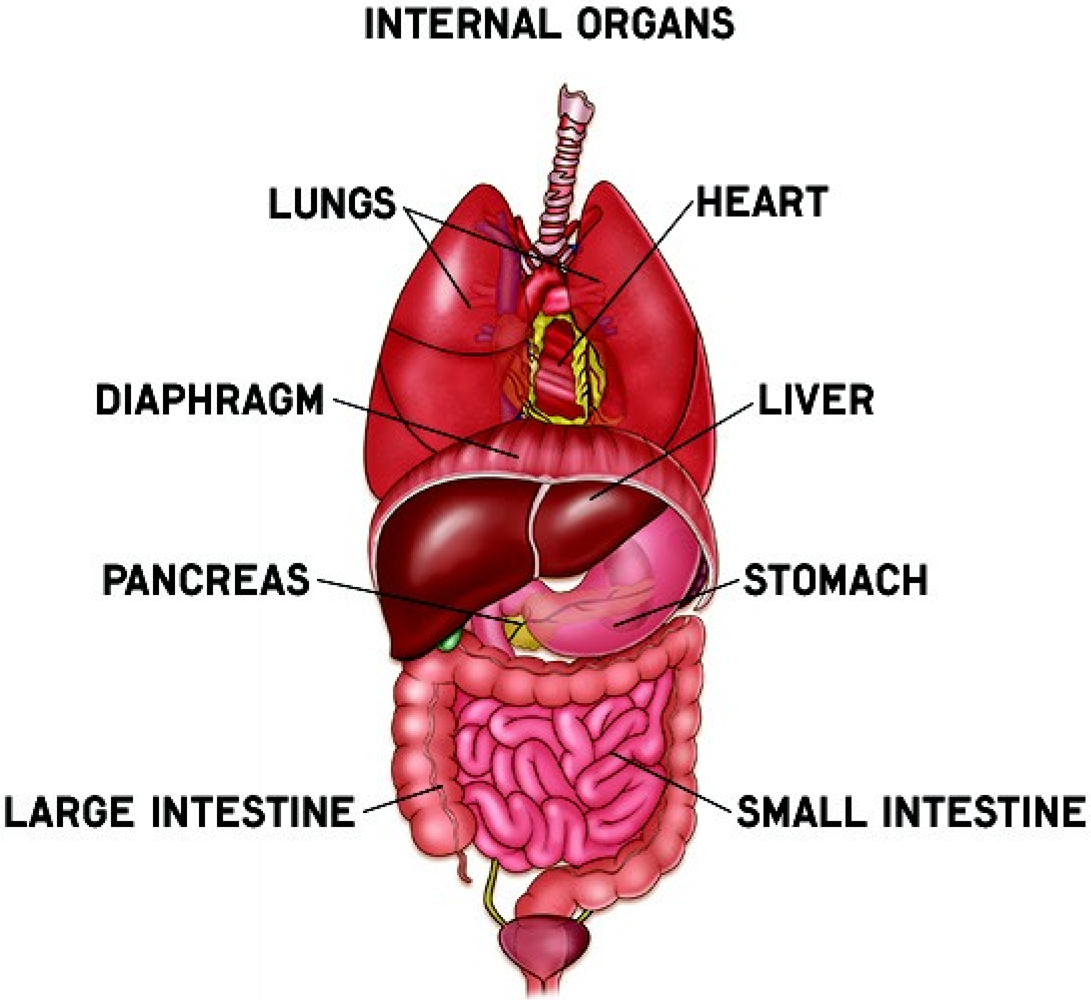
- T cells expressing TCR that recognizes self MHC molecule
  ➜ selected to survive
- T cells which don’t recognize self MHC molecule
  ➜ die by neglect

C Negative selection :اختيار سلبي :تختار كلون لتقتلها

To prevent autoimmune diseases

لمنع امراض المناعة الذاتية



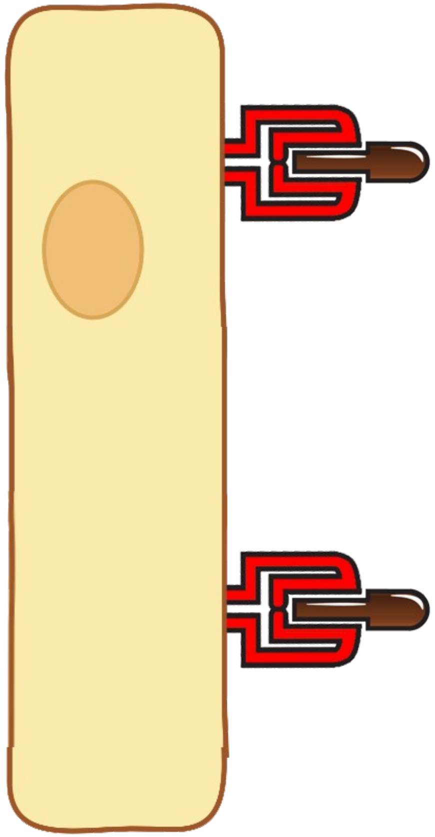


تحتوي على عينات من البروتينات الذاتية للاعضاء

C Negative selection :

كلون متفاعلة
ذاتيا

ensures self tolerance



تسامح ذاتي

Don’t react with self peptides

C Negative selection

T cells expressing TCR that recognizes self peptide (self reactive clones) are deleted by apoptosis **تحذف بالانتحار**

↓

Tolerance to self peptides (self tolerance)

↓

No autoimmune reaction

Positive & negative selection are called thymic education

تعليم في **hymus**

Release from thymus

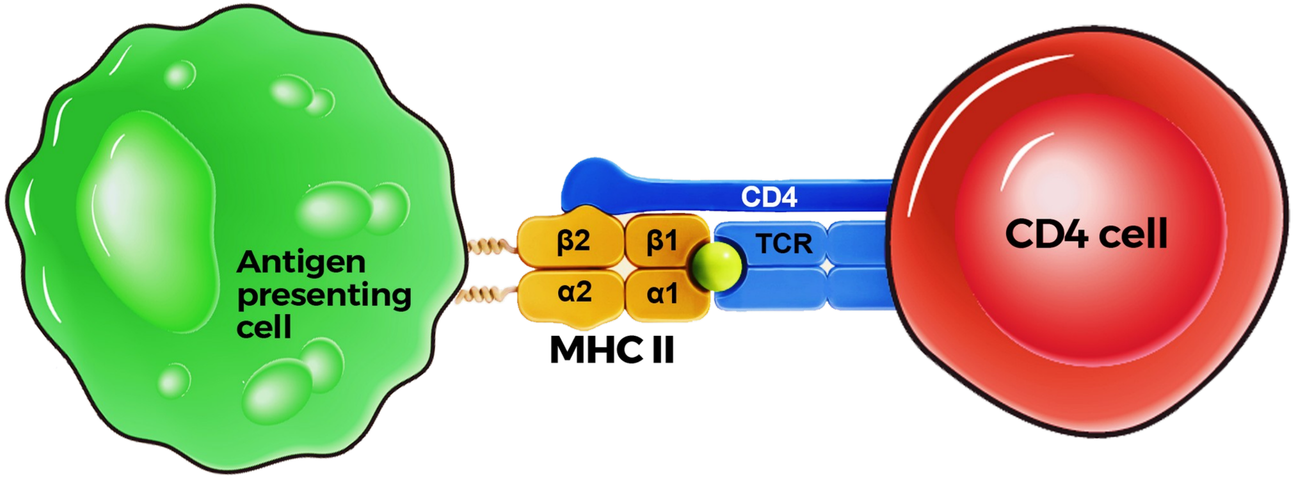
- Mature T cells are of 2 types :

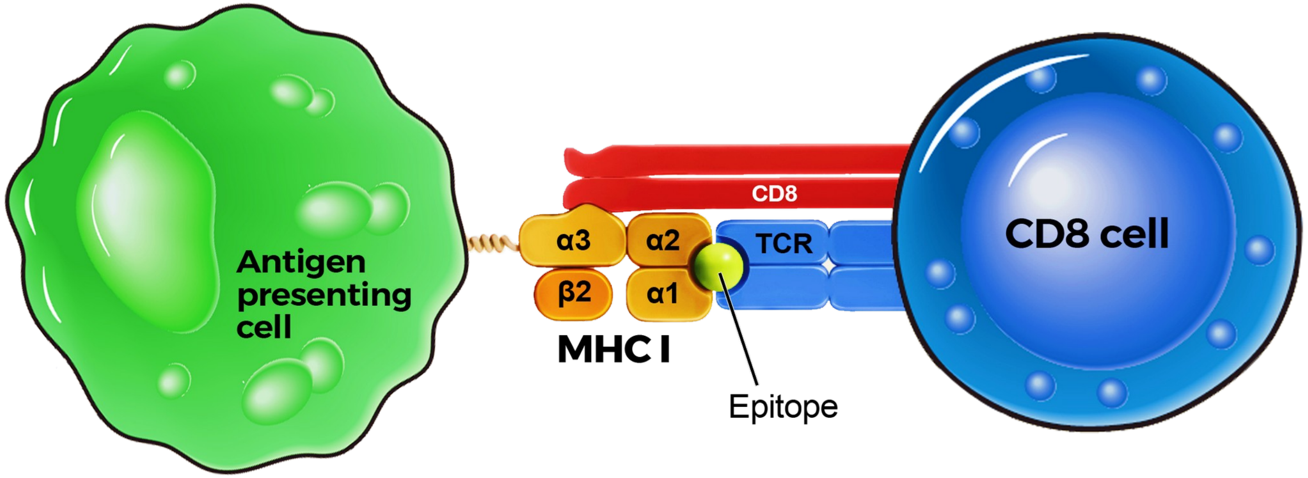
1) T helper (CD4+ cells)

Constitute 65% of circulating T cells
↓
Recognize foreign Ag
in association with self MHC class II

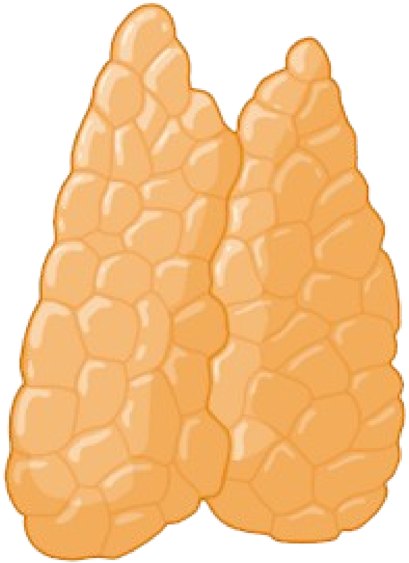
2) T cytotoxic (CD8+ cells)

Constitute 35% of circulating T cells
↓
Recognize foreign Ag
in association with self MHC class I





Release from thymus



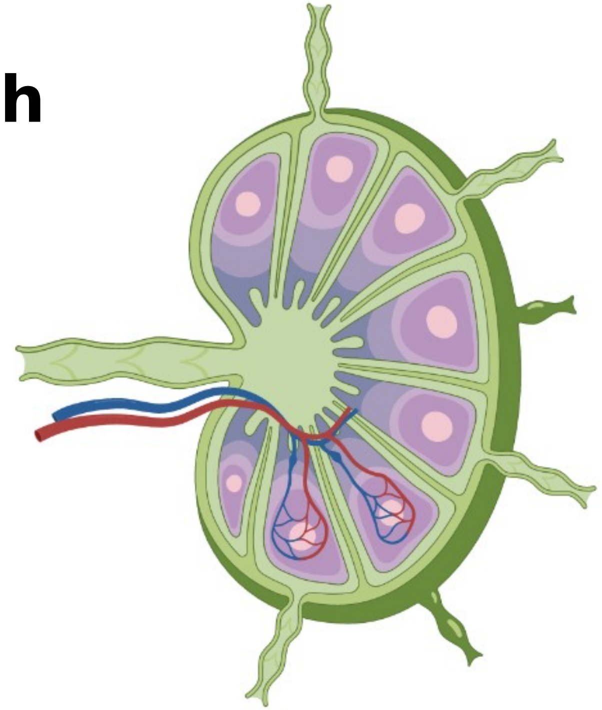
Mature T cells released from the thymus &

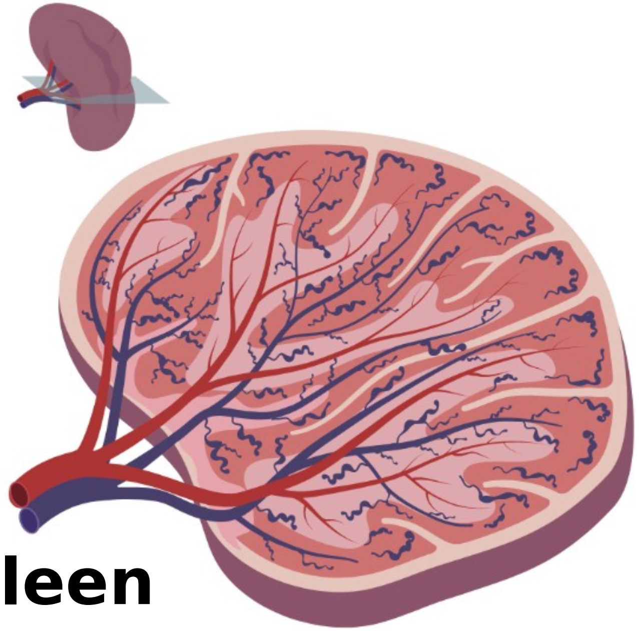
migrating to 2ry lymphoid organs :

Are called naive lymphocytes (mature that have never encountered Ag)

ساذجة

ناضجة لم تقابل Ag





Quiz 2

T cells released from thymus recognize which of the following?

a. Self Ag in association with self MHC

b. Self Ag in association with foreign MHC

c. Foreign Ag in association with self MHC

d. Foreign Ag without MHC.

e. Self Ag without MHC

C